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Technological Changes Including Job Changes will Continue as Long as There is Industry in America. Their Introduction Will be Accelerated by the War Effort. Their Improper Introduction Can Seriously Disturb Labor Relations, and be Very Distructive of Morale.

80 Points *about* Technological Changes

Digest and Commentary on Report

By John W. Riegel
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Technological changes in industry and business include the introduction of new machines, the improvement of old ones, the simplifying of hand methods of work, the use of new tools and materials, and the reorganization of teams of workers.

The introduction of technological change calls for varied policies and methods because the innovations themselves are of different types. At least ten types commonly occur.

Ten Types

One type is the installation of new machinery, designed and built by specialized firms. New machinery of this sort is strange at first to the users, including maintenance crews, supervisors and workers. But many specialized manufacturers of machinery provide set-up men and instructors to train the purchasing company's employees in their care and operation.

A second type is the installation of new machinery designed by the using company. These may be approved or disapproved by employees, according to the circumstances, and their outlook. If they can see only advantage to the employer, their attitudes will be antagonistic. Also technical difficulties, with the operation of such home designed machines (the "bugs" in them) are notorious, and cause many trials to technicians, supervisors and workmen.

A third type consists of the strengthening or other improvement of a familiar machine for higher output. It is hard for employees to avoid the conviction that

management is merely subjecting them to greater strain and accident hazard. Displacement of labor is often caused right at the point of application, and serious labor problems often result.

New tools and fixtures meet with varying employee reactions. A tool that makes work easier may not be opposed, even though it results in increased output. But some new tools make old skills obsolete, for example, unskilled paint gun sprayers may take the place of skilled brush painters, and cause trouble.

A sixth type of change is that of manual methods, generally as a result of motion study. In at least half the companies studied this type of technological change is of most importance. This type of change often benefits employees directly, improving physical conditions, and materials and tools, reduces accident hazards, and eliminates unnecessary and fatiguing motions. These could be used as selling points.

Most Frequent Type Now

A SEVENTH type of change consists in the sub-division of a complex job into two or more highly specialized jobs. Thus a whole tyre may be built by one highly skilled employee, or fifteen employees, each with a definite limited skill, may do the job. This is the type of change going on most frequently now.

Skilled manual jobs become mechanized, rendering the skilled workers unnecessary. An extreme example is a plant in which there were 1500 skilled employees on a hand operation. Today there are 12 semiskilled workers, turning out as much. Continuous rolling mills in the steel industry killed the jobs of thousands of highly skilled rollers. This type of change will be much minimized during the war, as there are not the engineers, designers and tool builders to make such new machinery.

The installation of conveyor systems is another type of change. Sometimes these conveyors pace employees or groups of employees, sometimes they merely carry materials. In all cases unless properly introduced, and an appropriate personnel plan arranged for them, their potential output capacity is reduced anywhere from 25% to 80%.

Friction Breeders

IT MAY be said that all technological changes generate friction in labor relations. From every point of view, it would seem desirable to reduce or alleviate that friction.

During the course of this study, one hundred employees and/or union officials were interviewed to learn their attitudes.

By far the most common sentiment expressed was that technological change displaces workers. Sometimes the changes are anticipated years ahead, and their effects on employment speculative, yet they "hang like clouds" over the minds of workers, who see in them future dis-employment.

There seem to be four possibilities: (a) technological change does not cause dis-employment really, but management has failed to convince workers that this is true. (There might be a very realistic quibble here, as to the long run and the short run—for it may be true, but the worker may be (if it were not for the New Deal) starved to death during the short run, and never receive the benefits management lays out for him in the long run, when he has gone to heaven.) (b) This theory is phony, and actually and realistically technological change must inevitably lead to unemployment, so there is no possibility of convincing intelligent American workmen anything to the contrary. (c) Workmen, aided by their union leaders, are ornery, and cannot or will not see the benefits that derive to them from technological change, and the greater number of jobs and wages they get from them. On this assumption, the only thing to do this force the changes on them. (b) Workers may decide to take the whole matter into their own hands, or at least have an equal say in the introduction of technological change, both as to pace and method, so that they ensure that they are at least not damaged by such change. This means full-labor-management cooperation, and is the current trend.

Bitterness Should not Be Underestimated

THE bitterness against technological unemployment should not be underestimated. However, it is not great among some employees. But these think that the benefits should be passed on, in reduced prices to stimulate consumer purchases, and thus increase demand. They justify labor's opposition to improved methods on the grounds that industry does not act on this theory but "hogs" the results.

Employee resentment against technological unemployment and under-employment was noticeably more marked among workers in large and prosperous companies than among employees in small, competitive vulnerable companies.

Employees often object to "job-improvement" because it leads to reduction in value of the job. As one labor official said "The company isn't interested in changing the 75¢ jobs, because wages can't be reduced there. But the $1 to $1.50 operations are continually being studied for possible improvements, to reclassify them at lower rates."

To some extent complaints about speed-up and strain are due merely to objections to changing from habitual methods. This is particularly so with older workers, who find readaptation hard.

Opinions varied as to cooperation of labor with management in improving methods. One man said, "The engineers discover too many ways of cutting down labor costs now. If a production worker finds a better way to do a job he should keep it to himself." In other cases employees were keen on participating in process improvement, and proud of the results achieved. In another case an employee got $5 for a suggestion, which led him finally to a temporary lower paid job.

Even more destructive of employee morale is where a supervisor first belittles a

worker's suggestion, and then turns around, and puts forward the suggestion as his own.

Information for Employees

EMPLOYEE attitudes in some cases seem to be improved when employees are fully informed about pending technological developments. The erroneous or confused thinking of some employees suggests that informative discussions might well include a wide range of facts about technological change.

Some employee spokesmen were skeptical about this idea. They say that often the changes are so far reaching and complex, that neither the labor leaders nor the workers, could understand them.

In other cases labor leaders did not wish for prior information to be given workers. Where job displacement is sure to result, a whole series of quarrels, and changes in seniority rules, precedes the introduction, and sets it off to a bad start.

In general, employees were not much interested in retraining for new jobs. Some however, thought joint union-management retraining programs should be set up. The Technical Trade School of the printer's union was cited as an example of what a union could do.

Employees are not generally in favor of share-the-work plans to take care of workers who would be displaced, unless it appears that unemployment will be temporary. They generally favored a shorter work week at higher rates.

Where employees are governed by seniority rules, technological changes always lead to jockeying with these rules to protect jobs, by departments and plant wide. This is a headache labor officials like to avoid.

Employees were not much appreciative of dismissal compensation, as a sop to them for job loss due to technological change.

Factors in Successful Application

THE successful introduction and installation of a technological change in a company depends upon the following group of factors: the competence of superintendents, foremen and technicians; the understanding by top executives of the difficulties involved; the reputation of the company as an employer; the company's competitive position, and the employee's knowledge thereof; the recent rate of company earnings; the wage plan in use; the steadiness of employment the company has been able to provide; recent expansion or contraction in the size of the working force and the degree to which past changes in the company have been successfully introduced.

Other variables which should be considered in making technological changes are: the effects upon worker effort and habits; the number of persons affected, directly and indirectly; the speed with which the change is put into effect; the extent to which employees approve the scheme; the age, length of service, skill, intelligence and sex of the employees to be affected.

Top Manager's Job

IT IS essential that top managers fully understand the process, the time required for individual readjustments, and the usual need for refining even the best plans after they are tried out. In most cases executives readily approve actions and expenditure of funds to mitigate adverse effects on individual employees.

Superintendents are of supreme importance in this work. They are expected to point out where improvements in standard practices are desirable, and to administer the improvements when they have been developed by engineering departments. Some superintendents are unable or unwilling to do this.

Immediate supervisors should participate in methods development so that they will understand proposed changes, contribute to them, favor them, and help get employees to accept them.

If consultants are employed, they should be required to discuss their plans with foremen, and in fact get the foreman's approval before starting any work in his department.

A number of companies have arranged courses in operation analysis for their junior executives. In some cases foremen were asked to bring to the course, for consideration, some operation in his department which he thought might be improved.

Superintendents and Foremen

IN SOME companies, after superintendents and foremen had been through a course, it was repeated for assistant foremen, machine and tool designers, group leaders and job setters.

To dispel the skepticism of some superintendents or foremen some companies sent them to visit competing firms to see the new programs in operation, and to talk with the executives of these companies about them.

Some companies, to stimulate interest of their superintendents and foremen, have meetings and competitions about them. Other executives disapprove of this, warning against getting a lot of suggestions that cannot be acted upon for a long time. They advise that a company should try to get only a small number of outstanding suggestions.

In regard to technicians—generally management engineers of one grade or another—there is reported difficulty in getting men who are inventive in mechanical matters, and also can deal with the human problems involved.

Thoroughgoing teamwork between operating executives and technicians is difficult. Operating executive prefer to refine existing methods, while technicians want to make very thorough changes. Generally a senior executive has to take time out to settle the matter.

Obtaining Employee Cooperation

In one company the foreman appointed two workers from each department to monthly conferences. Each attended only two conferences, then his mate was switched, and so on, alternately, so that discussion was continuous, but with a rapid turnover of conferees.

In another case a group of skilled men was called in for conference, and the change of jobs so that semi-skilled men could do them, freeing the skilled men for other work, discussed and approved by them.

In another case where this was wanted to be done, but no conference held, it was necessary to go round and explain the matter to each man individually.

In some cases it is necessary to show workers movies of what they are doing, and talk over with them faults in their methods, and develop with them better methods of operation.

Employee Suggestions

The prospect of getting valuable suggestions from employees seems best among skilled workers.

Several executives warned against launching employee suggestion systems along with a technical research program. The employee suggestions, which would have to be referred to the technical research staff, would just clutter up the department with a lot of petty stuff, when its efforts should be concentrated on a few important projects.

There are all sorts of ideas about teaching workers new jobs or new methods. Some think the technician should do it; some think the foreman should learn and then teach; some think that a few workers should be taught, and then teach others. Generally it was agreed that proper instructional methods should be worked out, and plans are outlined.

Then there was conflict of opinion as to whether when a new method was taught the employee should be required to do it exactly as the instructor wanted him to, or whether he should be allowed to vary from it. Some thought that variations lead to faulty methods, and that there is "one best way." Others thought that variations in muscular development, size of hands or length of arms justified letting a worker do the job his own way, provided a safe output is gotten.

Different practices were followed in compensation of workers learning new jobs. Hourly rated employees are usually paid usual rates; incentive pay workers were variously treated.

Ways of minimizing job displacement included: guaranteeing no displacement; scheduling changes so that displacement was taken up by transfer to positions made vacant by turnover and retirement; making changes only when payrolls are expanding; giving displaced workers first chance at new jobs; one company paid trans-

portation expenses of displaced skilled workers to their other plants. In some cases workers were transferred to lower rated jobs with promise of promotion at first opportunity, but pending transfer, given supplementary personal rates to keep their pay up.

Collective Agreements

A WIDE variety of clauses covering technological changes occur in bargaining contracts.

In one case the clause reads "The products to be manufactured, the location of plants, the schedules of production, the methods, processes and means of manufacture are solely and exclusively the responsibility of the Company." This looks an easy solution of the problem, but in actual fact has turned out just to transfer the union-management fight to questions of rates, seniority, claims of discrimination, etc. In other words the union agrees that the Company can do anything it likes, and the union will fight anything it does.

By contrast, the clothing industry unions have actively supported technological improvements in some plants. But this is due to the competitive condition in the industry—particularly the need of the higher paid union markets to be more efficient in the face of lower paid non-union centers.

Steel Worker's Clause

THE Steel Worker's Union ties its cooperation to union security, which it has now obtained through the WLB. Its clause is pretty stiff reading, in part, that the management will "share equitably with the union any benefits so obtained, in the form of increased employment, better working conditions, increased wages, or decreased hours. Nobody is to lose his job as a result of any improvement that is installed. If ways are discovered to do more work with less labor, they are to be put in gradually, and then only with the consent of the union."

The Mine Worker's Union does not object to new methods, but says that "Any change in mining methods or installation of equipment that relieves the mine worker of any of the above duties and increases his productive capacity shall be recognized and a piece work rate agreed to therefor properly related to the base rate.

In one agreement it is provided that the employer may not make changes unless they are agreeable to the union. Provision is made for arbitration, where agreement cannot be reached.

One contract reads that the "employer shall give the union reasonable notice prior to the installation for permanent use of any method which is revolutionary." Another contract requires six months notice of change.

Seniority and Technology

TECHNOLOGICAL change has led to the increasing use of plant wide seniority, increasing the security of long service employees, and concentrating its effects on

short service employees. This leads to "Bumping," many transfers, and much retraining.

Unions and managers have tried to avoid pay reductions for senior employees transferred on account of technological changes. This raises labor costs.

In one case a definite limitation was placed upon the company, as to the number of employees who might be laid off as a result of technological change, within a stated period.

Displacement allowances are provided for in some agreements and, because mostly short service employees are involved, most of these are much less costly than they appear to be upon the surface.

Outright union attempts to prevent technological changes are rare. They try to gain control over the introduction of such changes, and to impose obligations on employers who retain the initiative in making such changes.

Broad Generalizations

For some years efforts have been made to conserve the physical resources of the nation—its minerals, soils, and forests. The conservation of workers' skills and morale certainly is no less important particularly in wartime. Expenditures of public funds to secure the early reemployment of technologically displaced workers, and to qualify them for new employments, are particularly appropriate in view of the advantages which flow to the consuming public from industrial progress. Such expenditures, capably administered, should prove in a majority of the cases to be wise social investments.

These actions by the public, together with the humane administration of technological change by private employers generally, will help to develop a more favorable attitude on the part of employees toward such change.

That favorable attitude will be induced also by evidence that the cost reductions made possible by improved machines and methods are being passed on to consumers including the Army and Navy fairly promptly. Monopolistic action by employers that is intended to retain for themselves the fruits of industrial progress would run directly counter to the basic aim of society in allowing them full freedom to introduce innovations. Efforts of this sort should be met by prosecution under the antimonopoly statutes.

Public Should Be Better Informed

The public needs to be better informed about the fundamental importance of invention, enterprise, and competition in increasing war production and elevating the material plane of living of the whole community. Individual industries and companies could do much more than they have done to publicize the improved values in goods and services obtainable year after year as the result of the use of improved facilities and procedures by rival producers. These increases in war production and in the true purchasing power of all income receivers are the chief and the permanent results of technological progress.

The above is a digest of a report of a study by the Bureau of Industrial Relations of the University of Michigan, under the direction of John W. Riegel, published in book form under the title "Management, Labor and Technological Change."

As the result of a study of the experiences of industrial companies and the views of labor leaders and employees, the material is of great value to those companies contemplating technological and job changes—and who is not these days. It should therefore be read and used as a reference by all industrial relations men, and passed along to their associates in engineering planning and methods departments.

Two criticisms may be made. The book is too short, and while fully outlining principles to be followed, could well have been stretched another hundred pages which might have been taken up with specific examples. While the book is too short, the words are too long. This dulls it down too much.

The book may be obtained by writing, University of Michigan Press, Ann Arbor, Michigan. (Price $2.50.)

The Chief Medical Officer of the Country Whose Factories are Supplying General McArthur's Forces with War Materials Gives the Results of his Experiences and World Wide Studies of Factors Affecting Worker Output of Tanks Guns and Ammunition.

Bases *of* Worker Efficiency

By H. M. L. Murray, M.D.
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The animal body, considered as an agent for performing external work, consists of three parts. First, the brain and spinal cord (the central nervous system as it is called), where impulses originate; secondly, the nerves which convey these impulses through end-organs to the muscles; and thirdly, the muscles themselves which contract on receipt of these impulses and do external work. Adopting for a moment the analogy of the internal combustion engine, the central nervous system is a magneto, the nerves are wires leading to sparking plugs, and the muscles are cylinders where combustion takes place, driving down the pistons to do external work.

Work of the Blood

Here the analogy breaks down, for the products of combustion are removed from the muscles by the steady stream of blood which pours out of them in veins; these impurities are filtered out of the blood by a system of filters in various organs in the body, principally the kidneys and lungs. Some parts of the complex organisation which we call the human body are always working; for example, the heart, and the muscles which are concerned with breathing.

Therefore there are always some products of combustion being removed from some parts of the body by the blood; and the "filters" (as I have called them) which in turn remove those impurities from the blood, have to work twenty-four hours per day seven days per week. The fact that it is the blood which is the remover of waste products is very important, for that same blood, more or less purified by its "filters," is pumped to every part of the body.

Waste May Spread Through Body

So THAT, if there be an increase in the production of waste products as a result of muscular work in one part of the body, structures throughout the whole body may be affected by the resultant alteration in the chemical constitution of the blood. Of course, if the rapidity of removal of waste products were always equal to their formation, no accumulation would occur; but normally during work this is not so, and accumulation does occur. Consequently, if external activity—that is, the capacity for doing work—is to be maintained, sooner or later a rest must be interposed, during which not only must waste products be removed, but also worn-out or damaged muscle replaced.

This brings us to another physiological point which must be emphasized. The animal body—unlike the inanimate machine—produces kinetic energy by the combustion of its own working parts. Muscular work is really done by the oxidation of the muscle itself. In other and simpler words, the human machine does work by burning its own meat; after a period of work, it has, not only to get rid of the charred remains, but also to form more meat to replace that which has been used up.

Accumulation of Waste Causes Fatigue

FATIGUE, then, is due to the accumulation in the body of the products of combustion; and this accumulation may affect every part of the body. But it is possible to show by a series of practical experiments that some parts of the body are affected sooner than others. As a matter of fact, the central nervous system feels the effect first, then the nerve end-organs in the muscles, and, lastly, the actual muscles themselves. To return for a moment to our analogy of the internal combustion engine, the magneto breaks down first, and then the sparking plugs. The muscles, that part of our mechanism which performs external work, are thus protected against complete exhaustion by fatigue interfering first with the transmission of impulses, and then with their reception at the point where work is done. Therefore voluntary effort cannot entirely exhaust the muscles; fatigue is located not, as we are apt to think, in the muscles themselves, but in the delicate and complex structure of the central nervous system.

Many Small Movements Tiring

A CERTAIN minimal impulse has to be produced by the central nervous system before a muscle will contract at all. To produce a bigger contraction, a greater impulse is required, but not proportionately greater. Therefore the sum of a number of minimal impulses, which result in quite a small foot-poundage of work, may be far more fatiguing to the central nervous system than a few big impulses producing a much larger output of energy. In other words small movements frequently repeated are more fatiguing than larger movements at longer intervals, even though the latter may actually do more external work.

In a somewhat similar way the central nervous system is more fatigued by monotonous mental work than by work which requires the expenditure of energy in the production of a variety of thoughts. In modern repetition engineering processes, the operative, as a rule, is engaged in the frequent repetition of a series of small muscular movements, accompanied by the mental work of watching and controlling a small piece of machinery that does everlastingly the same job. When this work is continued during long hours we have the stage all set for the maximum production of fatigue.

Sugar in the Blood

ANOTHER theoretical consideration must also be mentioned. There is a good deal of scientific evidence that the rise and fall of muscular efficiency depends on the amount of sugar in the circulating blood; and this, in turn, depends to a significant degree on the presence or absence of undigested food in the stomach. The practical application of this is that, in an ordinary day-shift, it is advisable to institute a mid-morning and mid-afternoon "snack pause," as well as the usual lunch break. And similar pauses in other shifts are also desirable.

So much for the physiological background which forms the basis of an understanding of all problems of industrial fatigue; problems which are of the utmost importance at the present time. Unfortunately, there is a great and widespread ignorance even among those who should make it their business to be well acquainted with the subject. This is rather curious, because there is an immense amount of information available for those who care to look for it.

And there is nothing new about this knowledge; one of the best pieces of statistical research ever carried out was that of Vernon on output in relation to hours of work in munitions factories in Great Britain during the last war; this was published in the Report of the Health of Munition Workers' Committee, 1915–1918. But, although all this knowledge has been accumulated, it appears to be put away in various pigeonholes, and very little use is being made of it. I happen to have access to perhaps more of these pigeonholes than most; and I regard the dissemination of this knowledge as a very important part of my work at the present time.

Fatigue Causes Reduced Work

FIRST, let us try to obtain a clear understanding of what is meant by fatigue, and of the way in which it can be measured and prevented. Fatigue has been defined as "the sum of the results of activity which show themselves in a diminished capacity for work." This definition lays down that fatigue is essentially a negative quality—namely, a diminished capacity for doing work. Fatigue is preceded by activity, and its measure is the diminution in the capacity for work.

Bodily sensations, which are often appealed to as an indication of the presence of fatigue, are completely unreliable; fatigue may be progressively advancing with-

out any appreciation by the worker that his activity is decreasing; the steady maintenance of the quality and quantity of his output is the only sure indication that his activity is being maintained. In other words, a diminished capacity for work is the indication that fatigue is present.

The problem is to find out how we can establish the existence of a diminished capacity for work; for this purpose some means of measurement must be employed. Fortunately, in most industrial establishments records are kept for business reasons of three factors which are directly applicable to the incidence of fatigue. These factors are: (i) output, (ii) lost time and sickness, (iii) labour turnover.

Records of Output

To-night I intend to confine my attention largely to the first of these; through records of output, the results of activity can be measured. However, care must be exercised before deductions are made from output records; the type of work done throughout the period under investigation must not alter; the supply of materials and tools, and the pace of machines must not be changed; the output should refer to the same group of workers, and these workers must have been employed at the work sufficiently long to have passed through the stage during which practice increases output; and external conditions generally must remain unchanged. In other words, as in any other piece of statistical research, we must as far as possible eliminate the effect of all variables other than that which we intend to study.

If these conditions are satisfied, records of output form a most valuable—indeed a most striking—measurement of the incidence of fatigue. This type of record is particularly adapted to the study of the effect of hours of work on the production of fatigue; I shall deal with this in some detail presently.

Facts Known for 100 Years

Before I do so, however, I wish to remind you of the fact that before the last world war very little attention had been paid anywhere to this business of "hours of work." Yet, as a matter of fact, there was at least one well-documented experiment, even then nearly a hundred years old, showing the effect on output of reduction of working hours. In the early decades of the nineteenth century it was quite the usual thing for cotton mill employees to work ninety to one hundred hours per week.

There were a few notable exceptions among mill-owners, one of whom, Robert Owen began in 1816 to run his New Lanark mills for 10.5 hours a day instead of the usual fifteen or sixteen hours. He found that output did not fall below its previous level, although hours of work had been reduced about 45%; there was a great improvement in the cheerfulness of operatives, and it was noticed that they were able to work with renewed vigour.

Owen did not investigate the effect of still shorter hours; but many experiments have been made since his time. Among these may be mentioned the experience of

the Scotia Engine Works at Sunderland, where, some time in the eighteen-eighties, hours of work were reduced from fifty-four to forty-eight per week. When the labour costs of the engines manufactured were taken out in detail, it was found that in the first six months after the reduction of hours, these costs had actually decreased. In other words, less working time was being spent on the manufacture of each engine than previously.

A better known experiment was that made by Messrs. Mather & Platt in 1893, at the Salford Iron Works, a factory engaged in general engineering work. The working week was reduced from fifty-three to forty-eight hours; and when a careful and accurate comparison was made of the output in the year before and the year after the change, it was found that the total production was slightly increased, and that the output of the time-workers was rather more favourably affected than that of piece-workers. Sir William Mather laid these results before various government departments, and as a direct consequence the hours of work in government factories and workshops were reduced in 1894 from fifty-four to forty-eight per week. There was no falling off in output either by piece-workers or by time-workers.

Little Attention Paid to Them

THE lessons of these and other similar experiments were available in the first decade of this century to anyone who had the intelligence to grasp them; but, except in the case of a few enlightened employers, their significance does not appear to have attracted attention. This became very obvious when the war of 1914–18 broke out.

In war industry output and more output is the chief demand; early in 1915 a big increase in the production of munitions in Great Britain became a matter of vital importance. To this end hours of labour were increased, seventy to ninety hours a week being common, and over ninety not infrequent. Of course, the assumption was that if one unit of work could be done in one hour, then six units could be done in six hours, twelve in twelve hours, and so on. A simple calculation would give the expected output per week, per month, per year if you like. The actual results were found to belie this assumption, for output did not increase proportionately to time and effort expended. The calculations had gone wrong; the worker had been mistaken for a machine.

Best Hours

OF COURSE, nobody can deny that, within certain limits, an increase in the hours of labour will increase output; for example, in six hours more work will be done than in four. The best length of the working day is the problem; if nine hours' work produces nine times as great an output as one hour, will ten, eleven and twelve hours produce ten, eleven and twelve times as much?

To deal with this problem and others akin to it, the Health of Munitions Work-

ers' Committee was set up in Great Britain in 1915. The Committee was instructed ". . . . to consider and advise on questions of industrial fatigue, hours of labour, and other matters affecting the personal health and physical efficiency of workers in munitions factories and workshops."

Fluctuations in Output Rate

THIS Committee, after a very full investigation of the human problems in industry, prepared a report which summed up the experience in munitions factories in the plainest possible terms. The conclusions reached in that portion of the report which is relevant to my subject to-night may be summarised in two sentences: (i) Except for short periods during an acute emergency, an increase in hours of work, above an optimum which varies slightly in different industries, does not give a proportionate increase in output; on the contrary, it causes the rate of output to fall off with increasing rapidity. (ii) After a continuous period of overtime, improvement in output will take place after the reduction of hours of work; but there will be a time lag, so that this improvement will not be noticed until some time after the reintroduction of shorter hours.

These conclusions were reached as a result of a most interesting series of statistical investigations into the relationship of hours of work and output, investigations which form a classical example of the type of dispassionate scientific inquiry which was so urgently needed at that time. They were compiled originally by H. M. Vernon and published as a memoranda of the Health of Munitions Workers' Committee, and Vernon has given details of them in subsequent publications.

To-night I intend to consider four of these statistical studies in considerable detail. I have chosen these, not because I have any special preference for the work of Vernon, but because they formed the basis for the conclusions of the Health of Munitions Workers' Committee; and they are published in a convenient form in the report of that Committee, of a copy of which I happen to be the official owner. Since the war of 1914–1918 an immense amount of similar work has been done in almost every kind of industry, and in every case the result has been to confirm the conclusions reached in the original investigation.

Study of Women Workers on Light Work

MY FIRST example (Table I) is a study of women turning aluminium fuze bodies. The operatives were standing all day at capstan lathes, and had to subject each fuze body to seven successive boring and cutting operations, requiring close attention throughout, and some delicacy in manipulation, so that no relaxation of effort is possible during the series of operations.

In this particular example, as we follow it through from beginning to end over a period of more than a year, three separate factors are at work, each influencing the incidence of fatigue. These are: (a) A progressive reduction in actual hours of

work per week; (b) complete abolition of Sunday work; (c) the granting of holidays, previously withheld.

First Increase in Output

DURING the first period, in the weeks from November 14 to December 19, the actual hours of work were 66.2 per week, including eight hours' work on five Sundays out of six; these hours had already been maintained for a long time when Vernon's observations commenced. When hours of work were reduced to an average of 53.4 for the period from February 27 to April 16 the relative hourly output went up to 123, and the total weekly output was reduced by only 1%. During this period there was no Sunday work.

It should be explained that the improvement in the output per hour must have been gradual, the figure 123 representing the average over this period. This is emphasised by the fact that the average output per hour during the next period was

TABLE I

WOMEN TURNING FUZE BODIES

PERIOD (WEEKS ENDING)	ACTUAL HOURS OF WORK PER WEEK	RELATIVE OUTPUT PER HOUR	HOURS OF WORK × RELATIVE OUTPUT
November 14–December 19	66.2	100	6,620 (= 100)
February 27–April 16	53.4	123	6,568 (= 99)
May 14–July 2	54.8	134	7,343 (= 111)
July 9–July 23 (night shift)	50.0	132	6,600 (= 100)
July 30–August 19	47.0	124	5,828 (= 89)
August 26–September 1		Holiday for one week	
September 2–September 23	49.9	135	6,737 (= 102)
September 30–October 6		Holiday for four days	
October 7–November 4	48.3	144	6,955 (= 105)
November 11–December 16	45.6	158	7,205 (= 109)

134; three Sundays were worked, bring the hours of work per week to 54.8; the average weekly output was 11% greater than that obtained in the first period. From July 9 to July 23 the operatives went on night shift, working an average of 50.0 hours per week; the hourly output dropped slightly, probably on account of the disturbance to the normal routine.

Startling Drop

IN THE next period of three weeks, when the operatives went back on to day shift, with the average of 47.0 hours per week, there was a startling drop in production. Vernon says that this was probably due to the fact that the operatives had been at work continuously for three months, most of it very hot weather, and had been deprived of the usual Whitsuntide and August bank holidays. I think that this explanation is probably correct, for the operatives were all given a holiday for the last week in August, and during the next four weeks the hourly output rose to 135, which, on a basis of 49.9 hours per week, gives a weekly output 2% higher than in

the first period of this review. At the end of September there was a general holiday for four days for all industry, by government proclamation.

9% More Work in 30% Less Hours

THE two periods observed after this date, when actual hours of work were 48.3 and 45.6 show a progressive increase of hourly output to 144 and 158 respectively. These figures are equivalent to a total weekly output 5% and 9% greater than that obtained when the actual hours of work were 66.2. In other words, on this particular job 9% more work was done in 45.6 hours than in 66.2.

My next example (Table II) is one of a job which is done entirely by hand. This is what Vernon calls "sizing a fuze body." I am not acquainted with this particular name, but I recognized the process at once as soon as I read the description. "In this operation men are engaged in cutting threads in fuze bodies by screwing them into steel taps." (I think the word "tap" should probably be "die.")

TABLE II

MEN SIZING FUZE BODIES

PERIOD (WEEKS ENDING)	ACTUAL HOURS OF WORK PER WEEK	RELATIVE OUTPUT PER HOUR	HOURS OF WORK × RELATIVE OUTPUT
November 14–December 19	58.2	100	5,820 (= 100)
February 27–April 16	50.5	122	6,160 (= 106)
May 28–July 16	52.1	119	6,200 (= 107)
September 2–September 23	47.6	135	6,426 (= 110)
October 7–November 4	51.3	137	7,028 (= 121)
November 11–December 16	51.2	139	7,117 (= 122)

Men on Heavy Jobs

THIS operation requires little manual dexterity, but considerable muscular exertion. Owing to the heavy nature of the work, the men in this particular series of observations always worked in their shirt-sleeves, and usually perspired profusely. This work was always carried out by men; and as it was heavy, the hours worked were not so long as in many other jobs.

This table shows that progressive reduction in actual hours of work from 58.2 to 47.6 resulted in an increase of 35% in the relative output per hour, and of 10% in the weekly output. From this stage onwards there is a slight increase in the hours of work, and a continued increase in the weekly output. At first sight the figures in this table appear to contradict each other. I think that the explanation of this apparent contradiction lies in the fact, already mentioned, that after a continuous period of long hours, improvements in output does not commence until some time after the institution of shorter hours.

Time Lag in Improvement

IN this particular case the time-lag seems to be pronounced; and it is noticeable that, in the second period, when the hours of work were 50.5 per week, the hourly

output was 122, whereas more than eight months later a week in which the actual hours of work were 51.2 gave an output of 139 per hour. I do not think that this table indicates, anywhere, the optimum hours of work for this particular job. Vernon says that there were only two periods where he was observing what he calls an "equilibrium value"—that is, a period unaffected by the time-lag—and those are the first and last of this series of observations. He considers that, with a sufficient length of time to obtain equilibrium, a 47-hour week would have yielded an hourly output of 157, or a total output equivalent to an increase of 27% on that produced by a week of 58.2 hours. Knowing the type of work, I feel certain that better results would be obtained by shorter hours than those observed.

Machine Feeding Job

Turning now to a completely different process, we consider an investigation of women machining a screw thread on a fuze body. In this operation the machine does the actual work, and the only function of the operative is to remove the finished

TABLE III

Woman Machining a Thread

PERIOD (WEEKS ENDING)	ACTUAL HOURS OF WORK PER WEEK	RELATIVE OUTPUT PER HOUR	HOURS OF WORK × RELATIVE OUTPUT
November 21–December 19	64.9	100	6,490 (= 100)
February 27–April 16	55.4	109	6,039 (= 93)
May 28–July 9	54.6	114	6,224 (= 96)
July 16–August 6	54.8	121	6,631 (= 102)
September 2–September 23	45.5	121	5,506 (= 85)
October 14–November 18	48.1	133	6,397 (= 99)

product from the machine, place a new article in the chuck, and set the machine off again at the beginning of its cycle. This occupies about a fifth of the total time; for the remaining four-fifths the operative stands idly watching her machine. Many people are under the impression that this is an example of an operation in which the machine sets the pace; but the actual figures show that this is not the case (Table III).

Once again we see that a progressive reduction in working hours produces a steady increase in the output per hour, and once again the beginning of improvement in output lags behind the last two periods shown in Table III, where, early in September, a week of 45.5 hours corresponds to an hourly output of 121, whereas six weeks later the output was 133 per hour for a week of 48.1 hours.

When we consider that it is possible for the operative to speed up only one-fifth of each cycle of operations, and that the machine really does set the pace for the other four-fifths, it is rather amazing that, when we compare the first period with the last, we should find that when the hours of work were reduced by 16.8 per week, total output should be only 1% less.

A similar example occurs in the process which Vernon calls "boring top caps." This name conveys nothing to me; but the job is described as "the light labour of

boring top caps on semi-automatic machines," and we are told that the process is largely automatic, and that increase in output can be attained only by a more continuous feeding of the machines. This description enables one to recognise the type of work, if not the actual job. Once again the figures speak for themselves (Table IV).

Recovery from Previous Long Hours

It will be noticed that in the last three periods the hours of work were for all practical purposes constant; but once again there is a steady increase in the output per hour as the operatives recover from the fatigue produced by the long hours previously worked. The final result, a reduction in total output of only 3% when hours have been reduced from 72.5 to 54.5, is a striking example of the effect of shorter hours, even in an occupation which is largely automatic and mechanical.

The four examples which I have quoted fall into two groups: (i) Those in which substantially the whole cycle of operations can be speeded up by the efforts of the operative (Tables I and II); (ii) those in which only a limited portion of the

TABLE IV

Youths Boring Top Caps

PERIOD (WEEKS ENDING)	ACTUAL HOURS OF WORK PER WEEK	RELATIVE OUTPUT PER HOUR	HOURS OF WORK × RELATIVE OUTPUT
November 15–December 19	72.5	100	7,250 (= 100)
January 3–February 13	69.1	106	7,325 (= 101)
February 21–April 16	54.8	108	5,918 (= 82)
May 1–May 28	54.7	117	6,400 (= 88)
July 3–September 23	54.5	129	7,030 (= 97)

cycle of operations can be speeded up by the efforts of the operative (Tables III and IV).

Machine Seldom Sets Pace

Now we come to the much more difficult question of automatic machinery. One frequently hears it said that in this case: "The machine sets the pace." It is curious that there should be such a great fascination in that phrase about the machine setting the pace. It is one of those quotations which come trippingly off the tongue, and which satisfy the uninquiring mind; but, as I hope to show you presently, to apply this description to all types of machinery in repetition engineering is entirely fallacious.

It is true that in modern industry there is a great tendency to replace hand work by machines; but these machines range from those which are fully automatic, such as the modern printing press, to those which are power driven, but not automatic at all, such as a foot-operated guillotine. In most machine processes the relative importance of the human and the mechanical element varies between these two extremes; but in practically every case the operator is expected to keep the machine supplied with material.

Types of Semi-automatic Machinery

THE devices used for this purpose vary enormously; but in general all the semi-automatic machines used in repetition engineering fall into one of three classes. At one end of the scale the raw material is shovelled into hoppers in quantities which keep the machines supplied for long periods; a single worker is therefore able to look after several machines, and in such cases output is assured as long as the machine continues to function in a normal manner, while the operator merely watches a batch of machines and feeds them when necessary. At the other end of the scale each unit of material is fed separately into a hole or division in a moving dial or belt. It is obvious that this type of work requires some manual dexterity and a high degree of mental concentration.

Intermediate between the hopper-fed type of automatic machine and various types of dial and belt feed are the large number of varieties of machine in which the feed is by some device such as a chute. Here the operative may not have to feed the articles singly into the chute; it may be possible to use a handful at a time, and there is a varying margin, depending on the length of the chute, between the capacity of the magazine and the demands of the machine. In many cases the articles have to be arranged in a certain way before being fed into the chute; for example, in most bullet machines of this type the bullets have to be arranged with the points in one particular direction. Therefore this work also calls for both manual dexterity and mental concentration.

Now, I have frequently been assured by accountants and production managers that in all classes of automatic machinery "the machine sets the pace." A little careful thought will show that as far as output per hour or per day is concerned, this statement can be true only of machinery in which the whole of the feed is completely automatic; it can be applied to hopper-fed machines; but it is certainly not true of belt or dial or chute feeds. The average production engineer is not impressed by a bald statement like that; he likes to see facts bolstered up by figures. Fortunately, it is now possible to supply these, for in 1938 the Industrial Health Research Board published a report of an investigation in which machine-feeding processes were studied in great detail.

Ratios of Machine Efficiency

THE earlier stages of this inquiry were devoted to the collection of data concerning a number of different machine-feeding processes. The information obtained included (a) the possible output calculated from the machine speed and the hours worked, and (b) the actual output obtained from factory records over a period of three months. The machine efficiency is given by expressing the actual output as a percentage of the possible output. I have selected from the records of this investigation figures indicating the machine efficiency in a number of operations in the manufacture of small arms ammunitions (Table V).

Output Varies from 82% to 58%

IT WILL be observed that in no case is the efficiency of these machines (from the point of view of output) greater than 82%; and in some cases it is as low as 58%. In other words, in these operations the machine has not set the pace. To say, as some engineers and most production managers will, that in all types of automatic machinery, no matter what the method of feeding, the machine sets the pace, is patently absurd in the face of the figures which I have quoted.

The case is rather different with machinery in which the feed is completely automatic; for example, the hopper-feed type. Here the variation between possible and actual output is due largely to mechanical breakdown, and hence it is not directly influenced by the fatigue of the operative whose duty it is to feed and watch the machine. Generally, each such operative looks after a group of machines; if the

TABLE V

EFFICIENCY IN MACHINE-FEEDING PROCESSES

PRODUCT	PROCESS	TYPE OF FEED	NUMBER OF MACHINES	POSSIBLE OUTPUT	MACHINE EFFICIENCY: ACTUAL OUTPUT/POSSIBLE OUTPUT × 100
Cartridges	Heading	Dial	14	70	81.2
Cartridges	Piercing	Dial	5	120	57.7
Cartridges	Choking	Dial	4	100	62.7
Cartridges	Cap farmer	Dial	6	190	66.1
Cartridges	Forming	Chute	6	86	77.4
Cartridges	Cutting	Chute	7	76	76.7
Cartridges	Necking	Chute	5	80	64.2
Cartridges	Gauging	Chute	5	62	78.8
Cartridges	Assembling	Chute	5	114	77.7

number of machines to be tended and fed approaches the limit of each individual's capacity, then once again the element of personal fatigue is introduced.

For example, if it is just possible for any one person, working hard, to look after twenty machines for the first three hours of the day, then it is exceedingly doubtful whether the same person will be able to keep all these machines fed to capacity for the last three hours of a twelve-hour shift. In actual fact, these conditions do not obtain generally in Australian industry. It would appear that there is still, in general, no dearth of unskilled labour of the machine-minding type, and therefore one does not often see a factory in which operatives have to work to capacity to look after their quota of automatic machines.

Absenteeism with Fully Automatic Machinery

I HAVE been unable to find any reference to an investigation into the effect of variations of hours of work upon output per hour in the case of fully automatic machinery; and I think that such an investigation would be a profitless task. But when one turns to records of absenteeism, and of labour wastage, one at once sees

the effect of long hours. Absenteeism causes upset of production, because in modern factories, particularly in the manufacture of munitions, the final product is built up of many parts, each the result of one or more operations carried out by separate machines. If the operator of one machine is absent, the orderly flow of parts toward the final assembly is disturbed, and production suffers.

Similarly, a high rate of labour turnover means a high proportion of new hands, each of whom has to be taught to operate a machine, thereby occupying the time of a more skilled worker, and so upsetting the flow of production. The relationship between long hours of work and increased absenteeism was rediscovered in England in 1940. In a recent report by a Select Committee in Parliamentary War Expenditure, there appeared an interesting account of factory experience during the middle of that year:—

Feeling of Danger Increases Output

AFTER the invasion of Holland and Belgium the Government made a strong appeal for extra work, and factories were working 24 hours a day, 7 days a week. The Whitsun and August bank holidays were cancelled, as were also the local "wakes" customary in some parts of the country. The result at first was a big increase in output. The cry that the country was in danger had a big moral effect, which resulted in a quickening of the stroke.

Danger Remains but Output Falls

AFTER two months of extreme effort the expected symptoms began to appear. Absenteeism became much more common, and men arrived late for work. Sunday labour led in some instances to men taking a day off in the middle of the week, when, of course, they only lost an ordinary day's pay, and earned double pay on Sunday to make up for it. In the Royal Ordnance factories absenteeism rose from 10% to 15%, and at the end of July it was decided to discontinue Sunday labour wherever possible, and very often Saturday afternoon as well. The result was immediate. Timekeeping improved and production did not suffer."

If time permitted, I could quote many similar examples from experience in England and in the United States of America during and since the war of 1914–1918. But I think that I have said enough to show that there is ample information on this subject available for all who have the intelligence to use it. Let us see what use is being made of this knowledge.

In Great Britain the general principles are well recognized. There was a big burst of activity in June and July, 1940, when a large section of the community worked twelve-hour shifts for seven days a week. I have already quoted an instance of this. In September, impressed by the experience of the previous months, the Government ordered that the usual holidays should be restored. The Minister for

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Labour at this time recommended an immediate reduction of working hours to an average of sixty per week, with the aim of a further reduction to fifty-six or fifty-five.

Germany Had to Cut Hours

SIMILARLY, in Germany the hours of work have been cut down in consequence of numerous reports that workers in munition factories are showing signs of over-fatigue. The "Times" of December 20, 1939, quoted an order by the German Minister of Labour that the working day must not exceed ten hours.

In Australia the position is much less satisfactory; when it comes to organising shifts, there seems to be a fatal fascination about multiples of the figure "four." If sufficient labour cannot be obtained to keep all the machines in a shop going on three shifts of eight hours, then the only alternative which seems to occur to anyone is two shifts of ten hours might produce a greater output, the only reply is: "But then some of the machines will be idle for four hours a day."

I think it is fair to say that, two years ago, most of the industrialists tumbled over themselves to fall into the trap baited with the words: "Increased hours mean increased output." And the whole body of public opinion was behind the general, rather vague idea, that the way to get maximum production was to work everybody in the factories as long and as hard as possible.

Employees now Want Overtime

NOW many enlightened employers are alive to the folly of the position, and realise that this business of long shifts is hopelessly inefficient. But now it is too late. Employers are powerless to reduce working hours. The employees have taken charge, and any attempt to reduce overtime in a factory results in employees leaving that factory in search of more overtime elsewhere. The only remedy lies in Government action, fixing a maximum number of hours per week, which must not be exceeded in any industry. And since Government action seldom precedes public opinion, there is a great need to educate the public in this matter. As far as I am aware, there has been no attempt by any organisation to talk plain facts at the present time; and I suggest that it is a task which devolves upon us all. Surely the efficiency of production should be everybody's business, not just anybody's.

Especially at the present time is this need for education urgent; for now we are being stampeded into doing things which are hopelessly inefficient. A typical example of this is the proclamation prohibiting the ten-day break at Christmas, 1941. Many production staffs had worked long hours at high pressure throughout the year; and a break-down in production is inevitable if the pressure were kept up indefinitely. It would have been far better in the long run to retain the usual Christmas break; and the fact that this is not generally recognised illustrates the immense task in educating public opinion which lies ahead of all of us who have a knowledge of the actual facts.

Spurts Must Be Managed

ANOTHER example is the tendency at the present time to increase hours of work in the hope that increased production will assist the replacement of equipment lost in Malaya. The parallel between our present situation and that in Great Britain after Dunkirk is obvious. It is very important that those in authority should realise that any increase in production resulting from longer hours must necessarily be only of the nature of a temporary spurt; and these hours should be carefully watched and reduced as soon as possible, and certainly within three months. Otherwise, our production effort will be worse than it would have been if no spurt had been attempted.

Address delivered at meeting of members of the Institute of Industrial Management, Melbourne, Australia.

Some Companies Seem to be Getting Excellent Results from Their Union Cooperation Committees for Increasing War Output. Others are Not Doing so Well. Others have Limited Them to Bally-hoo. Others are Afraid to Try Them. They Are Risky Things to Try Except with a Full Knowledge of Their Possibilities and Limitations.

Joint Production Committees

By C. H. Northcott
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The necessities of the war situation have led to departures from industrial practice which many will consider radical in nature. In this, our experience is similar to that of the years 1914–1918, when much that was new was adopted and has since become standard practice. In particular, the Whitley Councils were set up, constituting the first industrial charter of the workers, and from them have sprung a number of works councils. These have afforded an opportunity for the workers to collaborate with the management and to participate, to some degree, in the direction of production.

Agreements on Joint Production Committees

A demand of the same kind has once more arisen, and the Minister of Labour is aiming to meet it by securing the voluntary agreement of employers and trade unionists to a series of production committees. Those responsible on the Government side for Ordnance Factories and for establishments under the Ministry of Aircraft Production have made, or are making, the necessary arrangements for what are to be called (and the title is important) "Joint Production Consultative and Advisory Committees."

Joint Aspect Important

They are "joint" in that both sides, management and labour, are represented. They are not executive, but "consultative and advisory." I have before me, as I write, the constitution of these committees in Royal Ordnance Factories, wherein

their object is laid down. It is to establish a medium "for the regular exchange of news between the management and the workers on matters relating to the improvement of production, to increase efficiency for this purpose, and to make recommendations thereon." In other words, their aim is to obtain the maximum output from the factory; the method is that of mutual consultation and advice on all matters that will further this aim.

Objectives

When this method is under discussion scepticism is often expressed as to whether cooperation is at all possible, and whether these are matters on which it is likely to be fruitful of good. The constitution from which I quote departs from the strict formality characteristic of such documents and gives illustrations. These are worth reproduction, though no one assumes that the list of possible subjects is complete:

(*a*) maximum utilisation of existing machinery;
(*b*) upkeep of fixtures, jigs, tools and gauges;
(*c*) improved methods of production;
(*d*) efficient use of the maximum number of productive hours;
(*e*) elimination of defective work and waste;
(*f*) efficient use of material supplies;
(*g*) efficient use of safety precautions and devices.

All managers will at once appreciate how wide a range of production these seven headings cover, and how many opportunities they alone will offer for increasing efficiency. But scepticism may still persist. *The London Times*, with the critics in mind, pointed out that many people would consider that the proposals challenge the alleged prerogative of the management to do all the thinking and planning. If we are to view these proposals justly we must face two questions.

(1) Are workers capable of thinking and planning, and, if so, within what limits?
(2) Is there any inherent prerogative in management from which the workers should be excluded?

The Worker's Contribution

Clearly, some workers are incapable of any contribution to the better working of the factory. There are some who have never entered into the birthright of knowledge and education that has become available since they left school—it is not their fault that this is so, but no amount of the spirit of co-operation or of goodwill can overcome this handicap.

On the other hand, the worker is the living depository of much skill and experience. He is the product of long industrial training. He knows how to use his machine, or, if he be a maintenance fitter, how to keep machines in condition.

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His job is to set up fixtures and jigs, or to use them and find how effective or ineffective they are.

He lives by using these to obtain production. He may incur criticism by defective work and waste, but he knows whether this arose from his own carelessness and want of skill, from the defective fixtures and tools, from the quality of the material or from the conditions of lighting and ventilation in which he must work. He has a skill and an intimacy of contact with difficulties which, when added to the capacities of the management, yield a higher sum-total of industrial knowledge. To neglect his contribution is deliberately to choose a lower level of efficiency than is otherwise possible.

Workers Help Best from Own Experience

THESE illustrations will reveal limits which necessity imposes upon the contributions of the workers. They can help best on things that are within their own experience. They know the day-to-day conditions of the work-room, the gaps in the planning of supplies, the tricks that the toolroom plays, the slowness with which their jigs and fixtures are made and set up after the production order has been given, the weakness in their machines, the way in which the "high-ups" draw plans without regard to availability of supplies—the machines and the labour available and so forth.

But the workers cannot buy the supplies: they know nothing of costing, though they can appreciate costs as factors in prices and in profits, they do not see enough of the production process either to plan or to route goods. These are specialised functions for which men need a long training and they lay no claim to capacities of this kind, but in their minds eyes they see their sons doing these jobs and are interested enough to want to find out about them.

Participation in Management

WHEN we come to the question of participation in management, we can only answer clearly if we examine the responsibilities of a manager. His main function is to plan and control. His management consists in carrying out the policy or policies of the Board of Directors. His responsibilities are executive; to carry them out implies instructions and these involve discipline in the sense of so ordering the activities of individuals as to secure their effective co-operation.

Now one thing is clear. Only one person can be the boss. A committee or advisory group may help in planning, but unless one individual accepts final responsibility for the plan, the result is likely to be confusion. Only one man can give an order, though others may advise him before he gives it, may lend much help in enforcing it, or even in punishing infringements of it. The practical realities of industrial life, therefore, preclude workers as a collective group from the exercise of management.

On the other hand, they may co-operate in securing its success. They will put their knowledge at the disposal of a sympathetic management. They may help greatly in carrying out plans of which they have been informed, and the purpose and nature of which have their approval. If the works rules, that is, the orders of the management concerning their work, have been drafted in consultation with them, enforcement becomes easier, and punishments less frequently resented. In connection with such offences as absenteeism, misconduct and theft, they can exercise their weighty powers of argument and example.

Many progressive managements have entrusted disciplinary matters like these to bodies of their workers, and have had no reason to regret what they have done. My own firm never appoints a new foreman or forewoman without submitting the name before hand to the departmental shop steward, and to the secretary of the foreman's association. We find that their approval gives the appointee greater assurance and thus makes possible a good start, which is a large part of success in the job.

Broad Justification for Production Committees

But production committees and all other forms of worker-participation are justified on broader and more fundamental grounds.

They represent a belated extension of democracy into the field of industry. We have enjoyed political democracy for a long time, and in exercising our political rights and responsibilities in a democratic way have attained to a national stability and unity unparalleled in modern history. We have had the opportunity of shaping the form of the society in which we live and have increasingly furthered the well-being of our fellow-citizens. We have come to recognise this opportunity as our fundamental right. This right is slowly being extended to industry.

In recent months, much complaint has been made of the way in which production is being carried on in certain factories. Through the establishment of joint committees the workers therein will have the responsibility of substantiating those charges and the opportunity of constructive co-operation in producing better results. This is how democracy works, and there is no reason to expect that its results will be less satisfactory in industry than they have been in the political sphere. The manager who is unwilling to cooperate with British workers has against him the verdict of 300 years of British political history.

Risk Must Be Recognized

But the novelty and the risk of this adventure into untrodden paths must be recognised. For success, democracy depends on the quality of its leadership and the intelligence of its members. The joint production committees become the leaders in the new situation. They replace the type of manager whose leadership was often dominant if not autocratic: they give a new position to the worker leaders

who previously were critical, though seldom obstructive. The type of manager wanted in a period of industrial democracy is one who is sympathetic, but firm and unprejudiced. The workers in such a situation are well served by an advocate who is open to conviction, is possessed of a sound and impartial judgment, and will put every ounce of strength behind his own arguments, but who, when convinced, will give full weight to those he has accepted.

During the last two decades the trade unions have tended to promote men of this type to office and position. When industry has done more in this direction, the industrial order will be more surely established.

The Measurement of Success

And now we may want to ask whether these joint production committees will work, and by what standard will success be measured. The answer to the first question depends on the degree to which they conform to the standards of measurement. These are two in number, viz., the welfare of the business and the growth of a better spirit within the establishment. The committees must in reality improve production and increase efficiency.

Greater output per hour must be obtained: machines must yield more, costs must go down. These are the ordinary business yard-sticks of success, for which there is no adequate substitute. But the growth of a better spirit is quite as important a result, for the absence of the co-operative attitude is an effective deterrent to increased efficiency. Most of the delays, the friction—in fact, most of the troubles—within industry arise from misunderstandings. Nothing is so sure to move these as personal contact, the friendly touch, the easy word of explanation so natural in face-to-face relationship.

Co-operation depends on mutual confidence and the foundation stones of this are personal contact and understanding. The joint production committees are the foundations upon which a better and more effective industrial order can be built.

The National War Labor Board Cannot Make All the Decisions Regarding Wages Hours and Working Conditions, Even if It Might Seem to Want to. Nor Can Acts of Congress or Presidential Directives. This Means that Local Negotiation and Arbitration is Just as Important as Ever.

Negotiation *and* Arbitration

By Charles S. Slocombe
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Unions do not become easier to deal with as they grow older, nor do labor disputes and labor tensions lessen, even during war. This is the finding of a recent study by the Harvard School of Business.

Current belief is that our labor troubles are in some measure due to the newness of unions and the lack of experience of their officers, and that they will in the course of time settle down, be more reasonable, and easier to deal with. The Harvard study, and English experience with unions, shows that this does not happen—unless it is so designed. Employee moral does not grow that way.

Avoid Continuous Acrimony

So that companies will not have to go on interminably, year after year, acrimoniously negotiating differences with their employees, and submitting unadjusted differences to outside arbitrators, careful study should be made of the nature and conduct of negotiations and arbitration, the result of which would be a practical working guide for the use of all parties engaged in negotiation and arbitration. Such studies cannot but help even those companies with amicable labor relations, as well those who have recurrent difficulties.

Some American companies have recognized that they must take the initiative and have deliberately planned and conducted their negotiations, and the administration of agreements reached in negotiations, so that over a course of time, the structure, organization, personnel, and operating methods of the union become adapted to the nature of the business, and a basis for continuous labor peace established.

It is the belief of these companies that only through such a policy, in which the employer, through skill in negotiations and without minimizing the sturdy independence of the union, helps to mold and adapt the union to the company or

industry, can labor peace be established. When it is so established, no radical legislation or any other disturbing element can break it.

The most important starting point for a planned improvement in industrial relations is in the nature and conduct of negotiations, which establish the basis of working relations between the parties. Administration of the agreement reached is also, of course, highly important, and should be used as a means of affecting subsequent negotiations, making them smoother, easier, and the agreement reached more suitable to the industry or company. If this is done, a policy of progressive improvement of morale and labor relations is inaugurated.

Check List of Negotiating Factors

LISTED below are factors which should be taken into consideration, and which it is thought employers should carefully consider when negotiating with unions or when facing arbitration.

The purpose of such studies should be to ensure that negotiators for employers are fully cognizant of the importance and weight of these factors, and how to take them into consideration, when negotiating and arbitrating, so that a fair outcome will result. Thus a basis will be laid upon which companies and industries can, without seeking to bring unions into subservience, so influence them that their structure, organization, personnel, and operating methods are thoroughly adapted to the company or industry, and labor peace high moral and output facilitated.

I. BACKGROUND

Structure of union—its control, relation of local to international officers, responsibility, etc.
An estimate of the strength of the union, and the strength of its position
Social and economic pressure elements present
Relation to other companies and industries
Relation to possibility of conflict, mediation, arbitration

II. SIZE OF NEGOTIATIONS

Where industry wide
Where company wide
Where individual plant units
Limiting subjects for negotiation
How to avoid, narrow, and limit matters
Strategic time factors in negotiation
Interim negotiations on single points

III. SUBJECTS OF NEGOTIATION AND HOW TO DEAL WITH EACH

Wage rates
Hours
Vacations with pay
Holidays with pay
Closed shop, preferential hiring, membership guarantee
Representation by union
Shop steward or committeeman system
Duties and methods of union representatives
Working rules, and breach of same
Disciplinary cases
Dismissal procedure
Seniority provisions
Changes in methods and rates
Union-management cooperation

IV. Factual Bases and How to Use Them

- Figures on cost of living, prevailing rates, business conditions
- Ability or inability to pay, competitive conditions
- Figures on current earnings of workers, weekly, annual
- Special reports on living standards—how to use them
- Computing total actual labor cost

V. Who Should Do the Negotiating

- Composition of each side
- Psychological differences need to be balanced
- Use of industrial relations department
- Use of line executives
- Use of outsiders, attorneys, labor economists, etc.
- Essential training for negotiation

VI. The Proper Conduct of Negotiations

- Actual conduct
- Personal relations of negotiators
- Where relations between parties are new
- When issues are new
- Which side presents case first
- Discussion, agreement, conflict
- Narrowing of unagreed points
- Counter offers, when to be made
- Adjournments for discussion with principals
- Disagreements, within each side
- Observers and audience to negotiations
- Attempt to end with improvement of subsequent relations

VII. Essentials of Sound Agreement Resulting

- What to watch in language to ensure clarity
- Use of improved base rates, and effect on differentials
- Use of wage classification plans
- Exactness and brevity of working rules
- Subsequent interpretation of clauses
- Provision for breach of contract
- Disciplinary cases
- Rules regarding labor saving devices and changes in methods
- Avoidance of disagreement over fictions

VIII. Post Negotiation Relations

- How to negotiate to improve relations leading to subsequent negotiations
- Results of too tight a hold—too loose a one
- How to deal with playing off one employer against another
  a. during negotiations
  b. during life of agreement

Arbitration

It has been stated by many arbitrators, counsel for employers and employer's associations, and counsel for unions, that under present circumstances, employers are at a disadvantage in arbitration proceedings, and so seek to avoid arbitration as a means of settling differences with unions.

They admit that, at present, the scales are weighted so that while arbitrators and arbitration boards try their best to hand down just awards, beneficial to both employers and employees, they may unconsciously and inevitably tend to give unions more than they are justly entitled to in making awards.

Poll of Opinion

A POLL of opinion reduced the following reasons for this state of affairs:

1. An employer often faces an arbitration for the first time, but is up against a union, which has had previous experience with arbitration.
2. The union therefore knows, from past experience, which arbitrator to select; what strategy to adopt; what procedure in arbitration to seek; the most favorable grounds on which to base its arguments; how to make out briefs; how to conduct itself in hearings; how to make up rebuttals; etc.
3. The employer, on the other hand, often allows the appointment of an arbitrator, whose social views or unconscious prejudices make him unsuitable, entirely fair though he may attempt to be; their strategy in approaching the arbitration, and determining procedure is often faulty; they often fail to see the best grounds on which to base their case; they fail to answer directly the arguments of the union; they do not realize the influence of briefs, rebuttals and hearings upon arbitration awards; they often prejudice their case by their attitude in hearings; they often seek the advice of counsel which is unsuitable or inexperienced in labor arbitrations; when they do get good counsel, they sometimes through ignorance of arbitration, do not properly back him up; sometimes they do not think even that they have to make any preparation for arbitration.
4. Unions have at their disposal, through their national and regional research departments, organizations with perhaps hundreds of cases in their files, briefs, rebuttals, transcripts of hearings and decisions. They can draw upon this rich store of material in drawing up their cases.
5. Employers, on the other hand, are often limited to their own lack of experience, or to the broader, but still limited, experience of their counsel.

This state of affairs embarrasses arbitrators, who seek to know all the facts and hand down just awards. It makes their work, in sorting the wheat from the chaff in evidence and briefs, and getting at the true picture of the situation, much too difficult.

Arbitrators feel that it is their job to hand down decisions that are beneficial to the industry or company concerned, without neglecting the rights of employees. They hate to feel that they may, through a lack of proper balance in presentation of data by one side or the other, hand down decisions that may be injurious to the progress of an industry or company, or to the employees, or to future labor relations.

Why Employers are at a Disadvantage

IT SEEMS high time, therefore, that an attempt should be made to redress this balance, in the interest of improved labor peace, in so far as this may be obtained by an increasing use of arbitration of unnegotiable differences between employers

and employees, rather than by the use of the strike or lockout weapon, force and violence, or turning plants over to government management.

Above are set out some of the reasons, stated by arbitrators and counsel for both sides, why employers are at a disadvantage in arbitration at present. These may be reasons why employers perhaps avoid recourse to this excellent machinery for the settlement of labor disputes, because they feel that arbitrators will inevitably hand down decisions unduly favoring unions.

The remedy for this situation lies in employers having a much better understanding of all the factors in arbitration proceedings; doing a much better job of presenting their cases before arbitrators, and/or doing a much better job of backing up their counsel in arbitrations, with unquestionable facts; and realizing the relation of negotiation to arbitration, and the way in which the former affects the latter.

If this balance can be redressed, perhaps through the aid of a study of proper arbitration methods and procedures, so that employers feel confident that when they go before arbitrators they will get fair unbiased awards, based on the merits of the case, they will more readily use arbitration machinery, and there will be less resort to wild-cat strikes and lockouts, and a discontinuance, or lessening, of the frequency and intensity of the labor war that has plagued America for the past eight years.

OUTLINE OF FACTORS IN ARBITRATION

1. *Relation of Arbitration to Previous Negotiations or Mediation*
   - Mediation or negotiation settles as many points as possible—those impossible to settle are left to arbitration
   - What the exact terms of reference to arbitrator should be
   - What exactly can be arbitrated
   - Should parties be bound by decision
   - What the stipulations should be
2. *When Arbitration Procedure Should be Determined*
   - At the time there is agreement to arbitrate
   - When arbitration opens
   - In between
   - What are the difficulties in agreeing upon procedure
   - How may they be overcome
3. *What is the Best Type of Procedure in a Given Case*
   - What is formal procedure
   - What is informal procedure
   - When each should be used
   - Procedure with briefs and rebuttals and no hearings
   - Procedure with briefs and rebuttals with hearings
   - Hearings without briefs
   - Other simple types
   - When these may be safely used
4. *What are Usual Subjects of Arbitration*
   - Wage rates—hours—working conditions
   - Adjustment of grievances
   - Interpretation of clauses in agreement
   - Disputes concerning which there is no clause, but a general provision to arbitrate
5. *What Evidence Should be Admissible*
   - How to deal with attempts to get arbitrator to deal with other matters
   - When should these be admitted and when not
   - Advantages of basing case on different arguments such as cost of living, prevailing rates, business conditions, inability to pay, precedents
   - What is legitimate and illegitimate distortion and falsification

What is the experience with unions and employers in this regard
Kickbacks from falsifications

6. *When Precedents are Advantageous*
Establishment of precedents

7. *How Decision Should be Arrived at*
What are the probable results of decisions
How the continuing relation of parties is affected
What is its relationship to present and next agreement
When arbitration award should be temporary in effect
What is the educative effect of arbitration and decisions on either party
How either side can affect the decision and its form

8. *Writing the Decision*
The decision itself
Detailed explanation of reasons for decision
When detail should be omitted as unnecessary
How much detail should be in decision itself
Differences between judicial arbitrations and others—when should either be used

9. *Rehearings*
Are they admissible—should they be asked for
Should they be objected to
Under what circumstances
Should they be by same arbitrator—another
How are they related to refusal to abide by decision by union, though previously committed to do so

10. *Subsequent Interpretation and Clarification*
Circumstances under which necessary
Proper procedure

11. *Impartial Chairmen*
As arbitrators
As having continuing relation to parties
Advantages, as in intimate knowledge of business
Disadvantage, as in supplanting authority of supervisory force
How they slow settlement of differences, large and small
When they are setters-up of hog-tying precedents
When to be used, when not
Types of situation in which suitable, and in which unsuitable

12. *General*
What should be bases for selection of particular arbitrator
Reasons why arbitration should or should not be resorted to
How to prepare briefs
When to use labor economists
When to use attorneys
What attitude of parties during arbitration should be
How to safeguard against fallibility of arbitrators
Popularity or otherwise of arbitrator following decisions
How to deal with internal distrusts, tensions, and conflicts in parties
Necessary or desirable background and experience of arbitrators
Avoidance of force as primary purpose of arbitration
How to minimize uncertainties, unknowns and untruths facing arbitrator
What relation of arbitrators to parties, before, during, and after proceedings, should be